

## Preparation of defined mixtures of THF, BDO and GBL by gas phase hydrogenation

## Abstract

- 5 The present invention provides a process for variably preparing mixtures of optionally alkyl-substituted BDO, GBL and THF by two-stage hydrogenation in the gas phase of C<sub>4</sub> dicarboxylic acids and/or derivatives thereof, which comprises
- 10 a) in a first step in the gas phase, hydrogenating a gas stream of C<sub>4</sub> dicarboxylic acids and/or derivatives thereof over a catalyst at a pressure of from 2 to 100 bar and a temperature of from 200°C to 300°C in a first reactor in the presence of a catalyst in the form of shaped catalyst bodies having a volume of less than 20 mm<sup>3</sup>, said catalyst from 5 to 95% by weight of oxide of copper and from 5 to 95% by weight of an oxide having acidic sites, to give a stream mainly containing
- 15 of optionally alkyl-substituted GBL and THF,
- b) removing any succinic anhydride formed by partial condensation,
- 20 c) converting the products remaining predominantly in the gas phase in the partial condensation, THF, water and GBL, under the same pressure or under a pressure reduced by the pressure drops in the hydrogenation circuit and at a temperature of from 150 to 240°C, in a second reactor over a catalyst which ≤ 95% by weight of CuO and from 5 to 95% by weight of one or more oxides selected from the group of ZnO, Al<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub>, TiO<sub>2</sub>, ZrO<sub>2</sub>, CeO<sub>2</sub>, MgO, CaO, SrO, BaO, La<sub>2</sub>O<sub>3</sub> and
- 25 Mn<sub>2</sub>O<sub>3</sub> to give a stream comprising a mixture of BDO, GBL and THF,
- d) removing the hydrogen from the products and recycling it into the hydrogenation,
- 30 e) distillatively separating the products, THF, BDO, GBL and water, if appropriate recycling a GBL-rich stream into the second reactor or if appropriate discharging it, and working up BDO, THF and GBL distillatively,
- and setting the ratio of the products, THF, GBL and BDO, relative to one another within the range from 10 to 100% by weight of THF, from 0 to 90% by weight of GBL and from
- 35 0 to 90% by weight of BDO only by varying the temperatures in the two hydrogenation zones and also if appropriate the GBL recycle stream.